

# National Digital Mammography Archive

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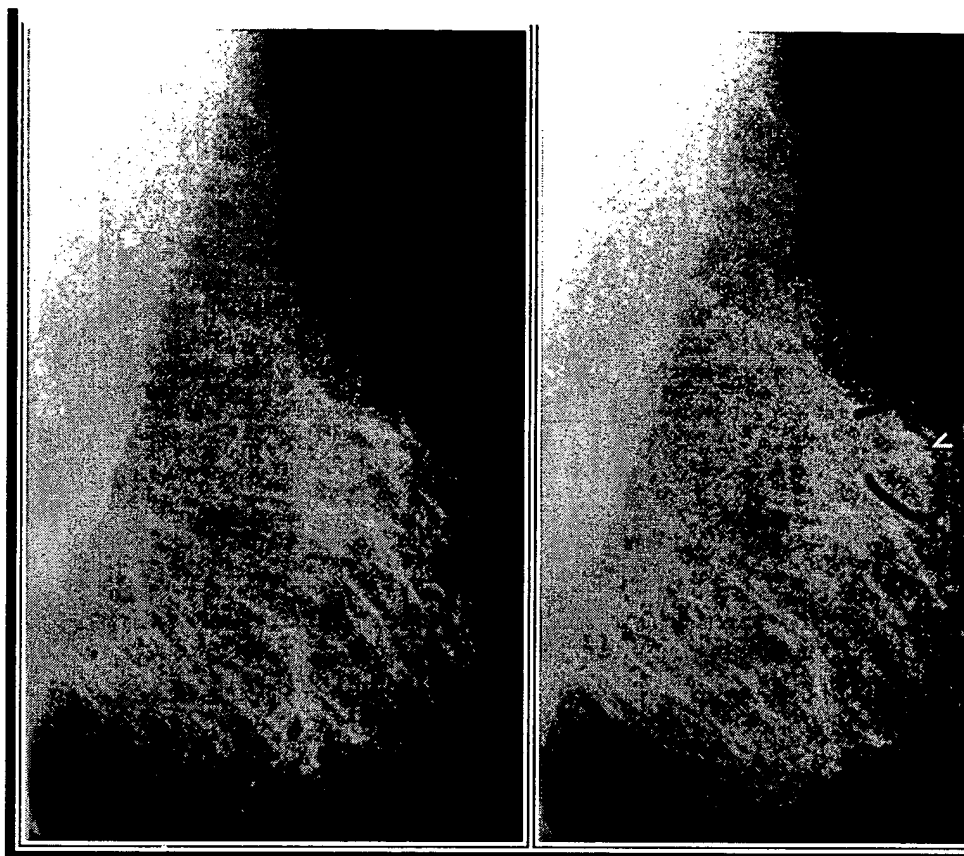
## Computer Aided Diagnosis

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## Computer-Aided Diagnosis and NGI

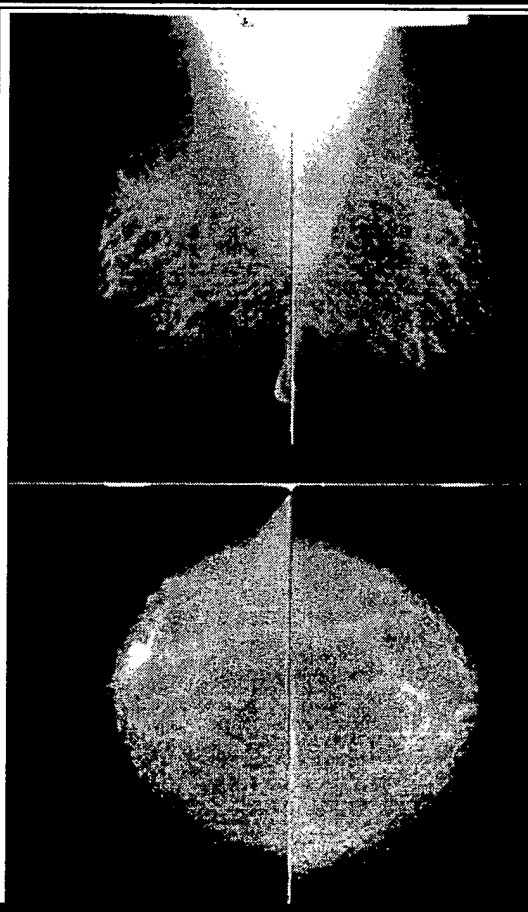
Computer-Aided Diagnosis (CAD) is a well-known technique that applies computer analyses to radiographs in order to provide computer assistance to radiologists in interpretation and informed decision-making. The CAD systems currently available essentially stand-alone systems that allow image input by film digitization and resu output on screen and hardcopy devices within the system.

New technologies are emerging that would allow computer-generated output on a digitally acquired image. Computer analyses could be provided as a service across network, enabling every site the ability to render a computer-aided diagnosis. This service could be available to process both screening and diagnostic images. Also, algorithms become more efficient at detecting anomalies when they are trained to recognize new patterns. Auto-training, using neural net technology could be accomplished much more easily and efficiently, if access can be provided through archive to pathologically - proven (biopsied, with results) images.



### CAD using NGI

- Requires specialized and dedicated hardware
- Access to multiple CAD vendors
- Large Training Set
  - Provides enhanced detection capabilities
  - Pattern Matching
    - Breast density
    - Regional differences



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## CAD as a Service



In principle, CAD could be offered as either a product (a computer and software) or a service offering CAD processing on a per-case basis. Whereas high-volume centers may find it profitable to purchase the equipment, smaller facilities may benefit from the availability of services that can be purchased as needed. There are also technical arguments for structuring CAD according to the service model, as the vendor can better control the processing environment and can better implement quality control and improvements.

Furthermore, the user would then be able to choose CAD schemes from different vendors depending on the radiologist's preference, performance of the computer analysis, reliability, cost, etc. The NCI will overcome the technical barriers to the evolution of this service model. The NDMA will make CAD available to be applied to images coming through archive to aid radiologists in decision-making. Initially, this service will support only screening images. Eventually, the service could be used for diagnostic purposes, as well.

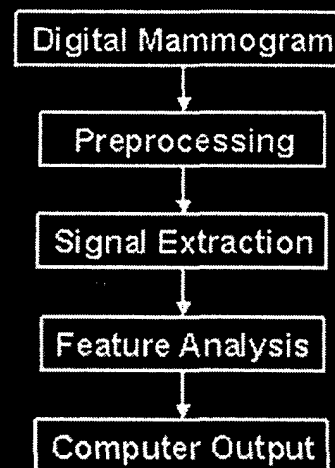
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## Auto-Training of CAD Algorithms

In addition to developing the standards and interfaces for supplying CAD service over the network, the national archive will be leveraged to train CAD network on specific patient strata so that an optimal network is available for each patient. Auto-training routines that operate at the archive level would train on patients from different geographic regions, of different ethnicities, and with different mammographic breast density. Training algorithms to recognize

pathologically proven findings (based on Bi-Rads and pathology, applied to neural networks so CAD algorithms recognize other patterns).

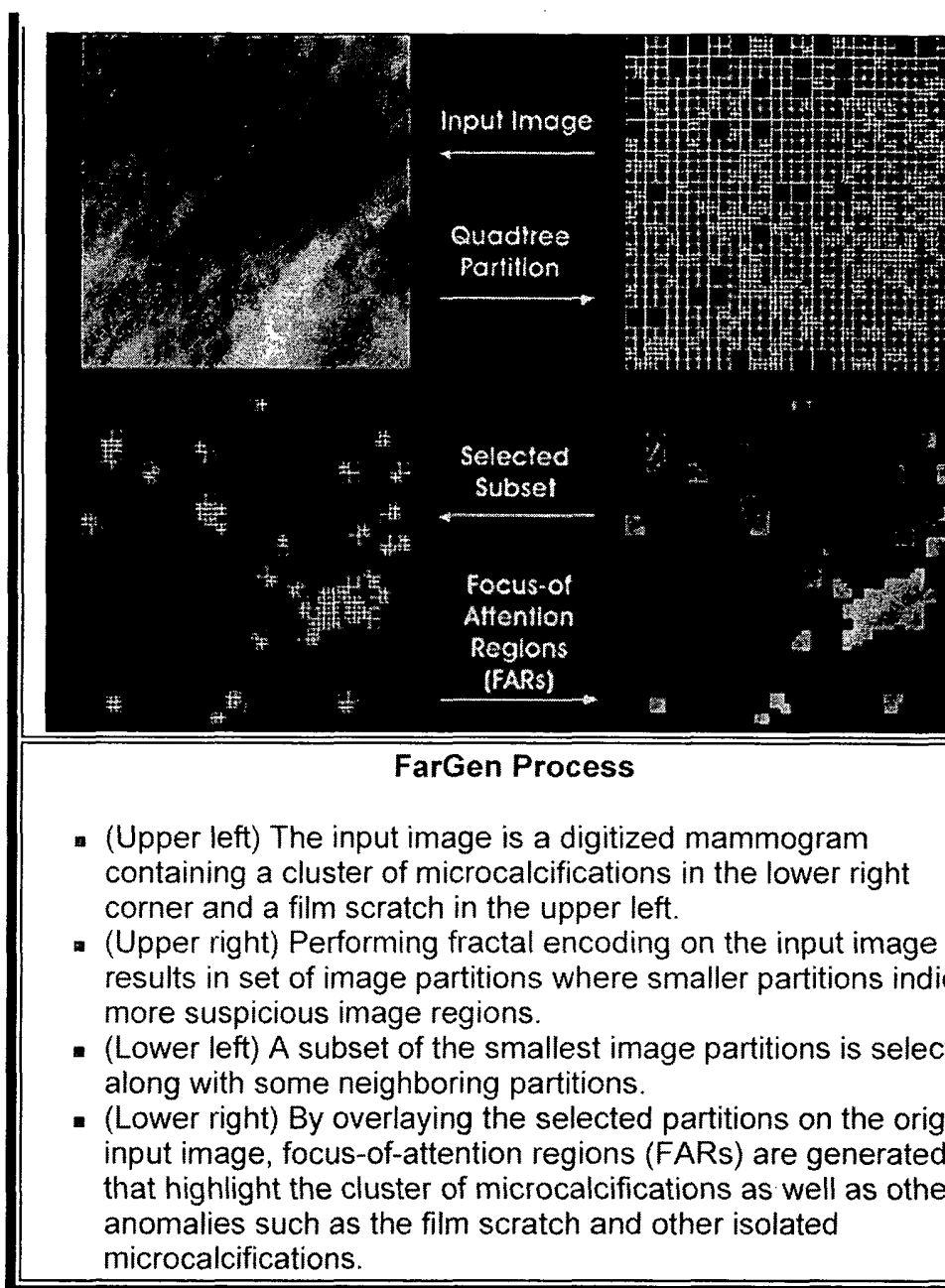
## Current CAD Scheme



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## Focus of Attention Region Generation (FarGen)

- A fractal-based algorithm used to subdivide the mammogram image into "suspicious" and "non-suspicious" regions.
- Developed based fractal image encoding technology (front-end to fractal image compression).
- Work is being supported by researchers at Oak Ridge National Laboratory and Texas Tech University.



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